

# Recycling Used Engine Oil by Re-refining

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**Presented at**  
**California 2005 Used Oil/HHW Conference**  
**“Building Hope for Healthy Communities, One Action at a Time”**

**Bahia Resort Hotel**  
**San Diego, California**

**April 28, 2005 - Dennis L Bachelder**



**API**

**American Petroleum Institute**

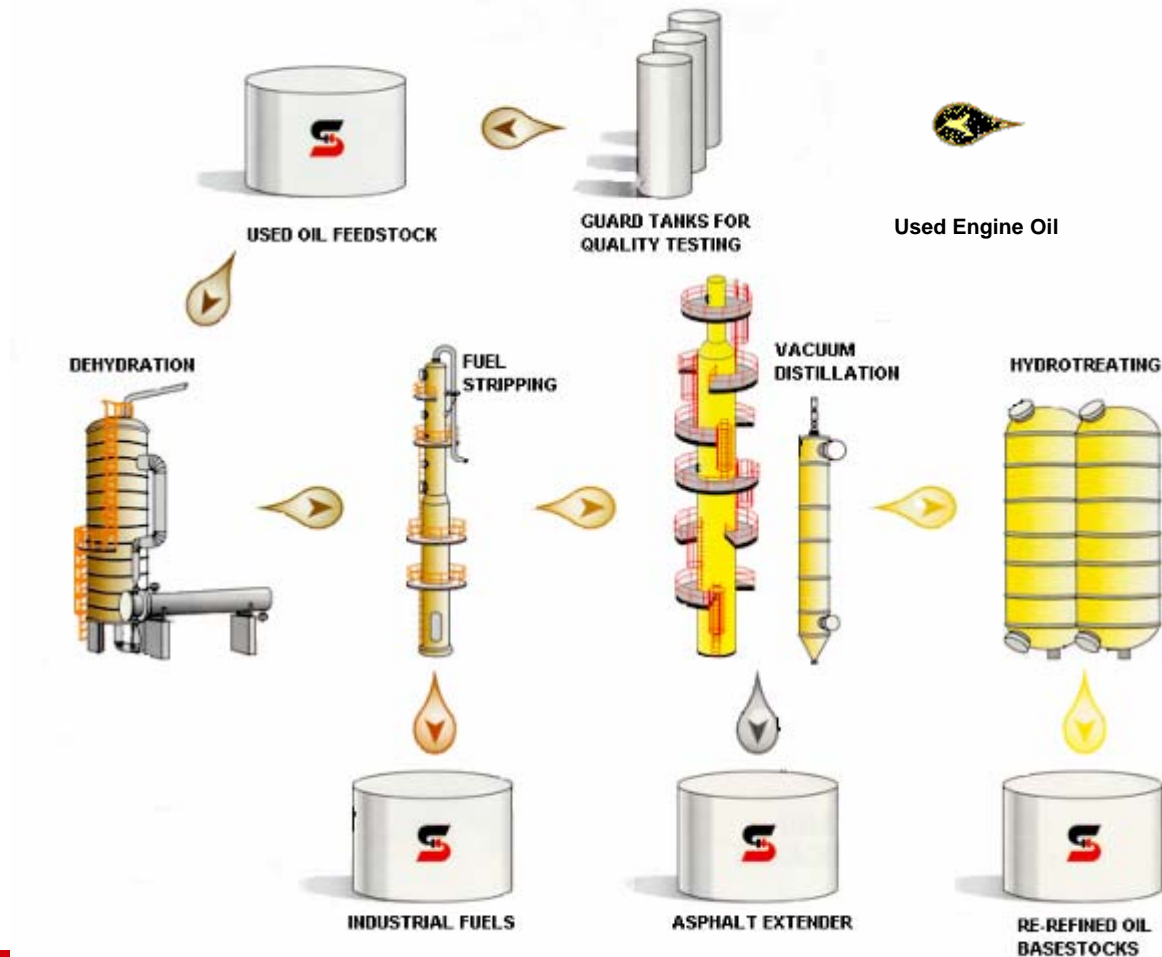
# What is a Re-refined Base Oil?

**It is used motor oil that undergoes an extensive refining process to remove contaminants, distill the used oil and reform the oil molecules to produce new base oils that have the same performance characteristics as virgin base oils made from crude oil.**

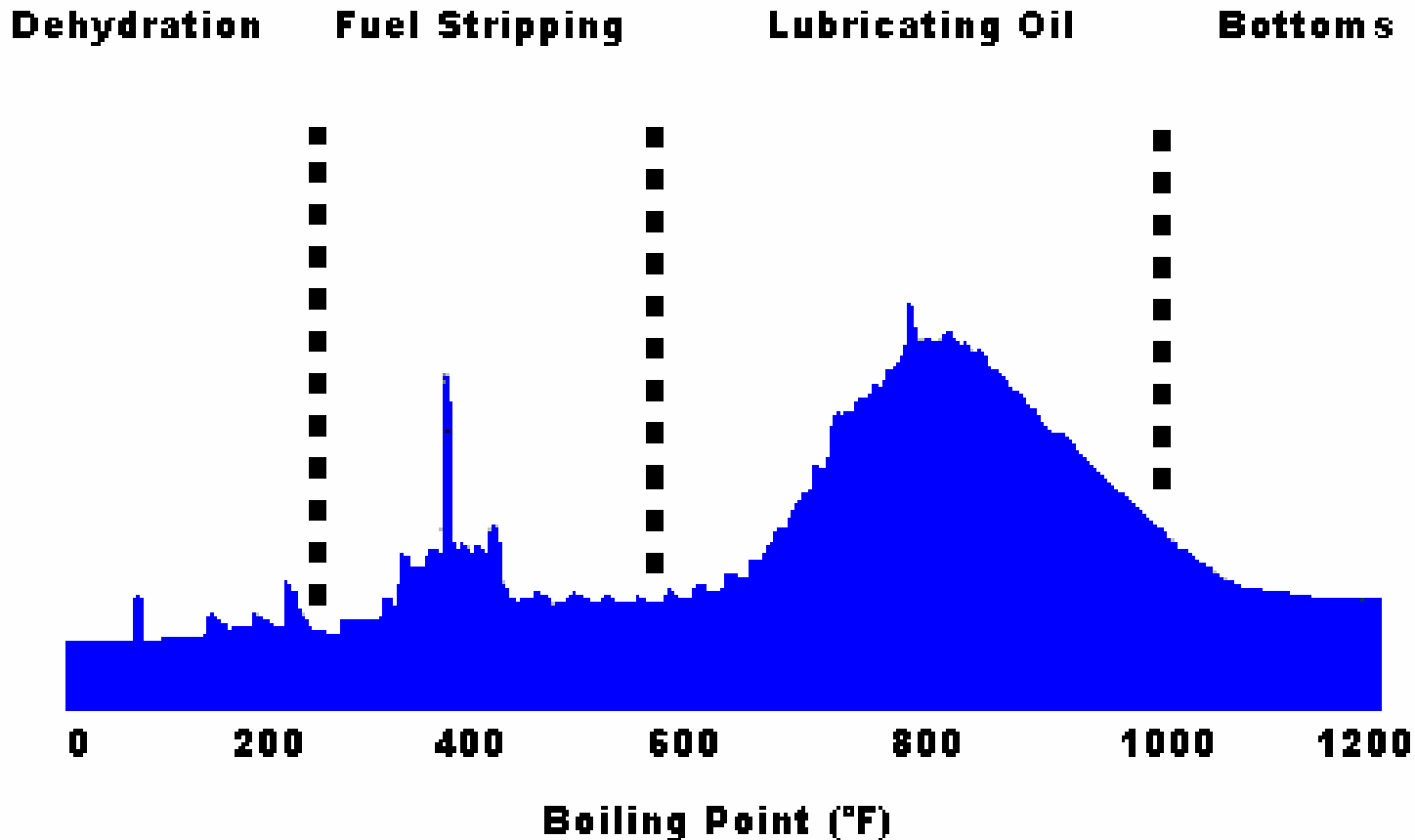
# Re-refined vs. Recycled Base Oils

- Recycled base oils using the acid-clay and the clay filtration processes are not the same as re-refined base oils.
- Typical concerns:
  - ◆ Do not get typical base oil viscosity fractions/grades
  - ◆ Recycled base oils may not have the same performance and oxidation stability
  - ◆ Quality may be very variable depending on feedstock

# Typical Re-refining Process



# Typical Distillation



# Re-refined Base Oil Quality

	Used Oil Feedstock	Vacuum Distillation Feedstock	Hydrotreat Feedstock Light	Hydrotreat Feedstock Heavy	Final Base Oil Light	Final Base Oil Heavy
Water (% Vol)	20	<1	<1	<1	--	--
Flash Point (°C)	>100	215	154	193	182	210
Vis. @ 100°F	N/A	375	85	230	90	240
Acid No. (mg/KOH)	2.4	4.0	1.5	0.5	0.01	0.01
Chlorine, ppm	2800	2700	1150	800	<50	<50
Sulfur, ppm	4000	4000	3000	3000	600	600
Zinc, ppm	550	550	<1	<1	<1	<1
Lead, ppm	70	70	<1	<1	<1	<1

# Product Quality

- Paraffinic base oils which meet or exceed customer, industry and government standards
  - ◆ Meets API Group I and Group II Specifications
- Capable of being formulated to provide lubricating oils meeting newest standards
  - ◆ API SM / ILSAC GF-4
  - ◆ API CI-4 Plus
  - ◆ GM Dexron IIIG Automatic Transmission Fluid
  - ◆ Military Specification (e.g. Mil-PRF-2104G)

# Re-refined base oil Relative Cost

- Re-refined base oils are typically comparable in cost to virgin base oils
- When there is a surplus of used oil there may be a slight cost advantage for re-refined base oils due to lower feedstock costs relative to crude oil
- When higher VI used oils are available as feedstock it is possible to make high quality API Group II base oils



# Re-refined Base Oil Cost Pressures

- Competition for used oil feedstock
  - ◆ Used as a Marine Fuel increases the price of the feedstock
- Collection Logistics
  - ◆ Must have a source of used oil from Quick Lubes and Industrial Accounts within a reasonable distance
  - ◆ Used oil must be relatively good and free of excessive contamination (e.g. solvents, coolant, etc)

# API Service Category Certification

- Re-refined Base oils, when formulated into an engine oil, are capable of being Certified and Licensed by the API Engine Oil Licensing and Certification System (EOLCS).
  - ◆ All API Licensed products meet the performance requirements set by the manufacturer for their engines.

# API EOLCS Quality Trademarks

- Re-refined Base oils, when formulated into an engine oil, are capable of being Certified and Licensed by the API Engine Oil Licensing and Certification System (EOLCS).
- Only Licensed Engine Oils Carry the API Quality Trademarks for easy consumer identification.



API Donut<sup>®</sup>  
Gasoline Service Category



ILSAC Starburst<sup>®</sup>



API Donut<sup>®</sup>  
Diesel Service Category

- All API Licensed products meet the performance requirements set by the engine manufacturers.

# Re-refined Engine Oil Availability

- Engine Oils formulated with Re-refined base oils are in marketplace
  - ◆ Primarily Drum and Small Package
- Some Engine Oils Indicate that re-refined base oils are used
  - ◆ Safety-Kleen America's Choice
  - ◆ Chevron ECO
  - ◆ Evergreen Motor Oil
  - ◆ 76 Firebird
  - ◆ Rosemead SOAR DLX
  - ◆ Lyondell Enviroil
  - ◆ Hick's Oil Natural Choice
- Others Do Not Indicate they use Re-refined oil
  - ◆ Concerned about public perceptions
  - ◆ Blend re-refined base oil with virgin base oil
- Distribution
  - ◆ Most distribution through Commercial and Retail Distributors
  - ◆ Some Distribution through retail outlets (e.g. Auto Zone, Pep Boys, etc.)

# Summary

- Re-refined Base Oils have comparable performance to Virgin Base Oils
- API Licenses Engine Oils formulated with re-refined base oils carrying the Newest Engine Oil Service Categories
- Re-refined base oil can meet the performance requirements of the OEMs and the Lubrication Industry.